United States Department of the Interior

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Mountain-Prairie Region

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MAY 02 2002

Memorandum

To: Project Leader, Arapaho National Wildlife Refuge

From: Chief, Division of Water Resources

Subject: 2001-2002 Annual Water Use Report/Management Plan

The subject reports for Arapaho National Wildlife Refuge Complex (Bamforth Lake, Hutton Lake, and Mortenson Lake National Wildlife Refuge Satellites) have been reviewed. There appears to be a discrepancy on Table II - Total Refuge Diversion, Refuge 2001 AF Diverted lists 9701 AF, while column totals 9873 AF. Which figure is correct? Correction made 5/13/02 MB

Attached is the Review/Approval page for your files. Thank you for the timely submission of this report.

Attachment

ARAPAHO NATIONAL WILDLIFE REFUGE COMPLEX
HUTTON LAKE NWR, BAMFORTH LAKE NWR,
MORTENSON LAKE NWR SATELLITES

ANNUAL WATER MANAGEMENT PLAN
2001 WATER USE REPORTS
2002 RECOMMENDATIONS

Prepared: Pam Billesi — Wildlife Biologist — Date: 3/28/02

Submitted: Gregory J. Sauger — Project Leader — Date: 3/28/02

Approved: Ron S. Cole — Refuge Supervisor, CO, KS, NE. — Date: 5-6-02

Reviewed: Chuck Willis — Chief, Div. of Water Resources — Date: 5-1-02

Approved: David E. Hoffman — Acting Regional Chief, NWRS — Date: 5/6/02

ANNUAL WATER MANAGEMENT PLAN 2001-2002
Arapaho National Wildlife Refuge

I. Introduction

Arapaho National Wildlife Refuge uses five primary sources of water to provide irrigation, maintain pond levels and sustain riparian vegetation for wildlife. These five sources are the Illinois River, Spring Creek, Antelope Creek, Soap Creek and Potter Creek. Sixteen different headgate structures divert water out of the Illinois River into more than 70 miles of primary delivery ditches. This water supplies over 77 ponds with over 807 surface acres of water and irrigates over 9,000 meadow acres during a normal year.

In 2001, the Illinois River opened in late March with average flows and maintained moderate flows throughout the spring with very little flooding. The Hubbard #2 and Howard headgates were opened in late March with ditches ice free by the end of March. Due to a storage call on the Illinois, by Walden Reservoir, these were the only two ditches that could be opened as they had senior storage rights. All other ditches were opened the first part of May, once the storage right call was fulfilled. The River peaked on May 21st but dropped considerably by mid June.

Wetland conditions for the spring were poor with may ponds dry from the fall. Most of these wetlands finally received water by mid May but over half were not full in late May and irrigation calls on the River prohibited the complete filling of them. Water conditions deteriorated rapidly in June with all but three headgates closed during the month due to the irrigation calls on the Illinois. The River was dry on the north end from the middle of July through early October when moderate flows returned. Flows on the southern end of the Refuge were almost nonexistent for the last half of the summer. With no fresh water, pond water levels dropped over the summer creating the poorest fall conditions in many years with most wetlands dry and the potential for filling them in the spring doubtful.

Precipitation in 2001 was 11.15 inches with snowfall measuring 46.1 inches in Walden. Extreme temperatures were 91° Fahrenheit in August and -27° Fahrenheit in February. Snow pack levels in the Illinois River drainage were 68% of normal as of February 2002. The outlook for spring runoff flows is poor, Refuge wetlands are dry and many of the large storage reservoirs in the County are very low, meaning there will be storage calls on the River. This will limit what ponds if any can be filled on the Refuge in the spring, other than the Case Reservoirs.

II. Purpose and Methods

Spring run-off is diverted from natural water courses into delivery ditches to provide wetlands and irrigation systems with water. Approximately 9,000 acres of meadows are

flood irrigated to maintain and perpetuate quality nesting habitat for waterfowl, shorebirds and other wetland dependent birds. Numerous ponds are also managed via diverted water each year to provide breeding and brood rearing habitat for these same birds.

Current water management practices greatly depend on winter snow packs, spring moisture and downstream water demands. Future water management practices will address the Refuge's depletion issues and work toward keeping depletions at the current average level. At this time the Refuge is looking to obtain junior water storage rights before the year end on all ponds without existing storage rights. These rights would be administered by the local State Water Commissioner. The Refuge may also at the same time seek to legally establish alternate sources of storage for water from the three Case Reservoirs, which have senior storage rights, to help offset the junior storage rights in dry years. There is also some thought of creating additional storage in Muskrat Pond to facilitate the ability to flow water to Walden Reservoir if an injury occurs. At this time the following management practices will be used:

March/April - (spring breakup) Open river headgates as snow pack allows, with major headgates opened early to mid April. This water will flow directly into ponds to create as much open water as possible to attract and hold migrating waterfowl. Refill the Case Reservoirs, which were drained in the fall, with spring run-off water plus river flows and hold at optimum levels to provide breeding and brood rearing areas for water birds.

May - Initiate meadow irrigation as soon as ditches are ice-free and operable to provide optimum habitat for nesting waterfowl, shorebirds and other marsh birds. Perform ditch maintenance as needed. Record water flow measurements weekly. If needed make water conservation efforts on a select group of headgates using information provided in Table I.

June - Maintain pond levels and continue irrigation to maintain habitat for nesting, and breeding birds. Record water flow measurements weekly. If needed make water conservation efforts on a select group of headgates using information provided in Table I.

July - Consolidate water as necessary to provide brood habitat for waterfowl, shorebirds and other wetland dependent birds. Record water flow measurements weekly. River flows may increase during this month, as off Refuge irrigation ditches are shut-down for haying. Continue irrigation in the early part of the month, as water permits, for waterfowl nesting habitat.

August - Begin repairs on dikes and control structures and any new construction projects. Most ditches will be closed by this time, water flow measurements will continue on all open ditches. Maintain minimal water flows in specific ditches to provide stock water as part of the Refuge Grassland Management Plan.

September -. Drain upstream storage reservoirs (Case #1, #2, #3) on to lower units to recharge smaller ponds before freeze up. Continue work on construction and repair projects. Record water flow measurements weekly on any ditches still open.

October - Prepare for scheduled recharge fill of storage reservoirs as needed. Winterize water system, drain irrigation ditches, "set" water system in preparation for spring run-off. Continue construction and repair work as needed. Initiate drawdown of ponds on schedule.

November - Normal freeze-up period. Pre-snowfall 'dirt work' still possible.

December - March - Normally cold, frozen conditions prevent water management. Nesting structures can be repaired/maintained and water management structures can be built.

III. 2001 Water Usage

Water usage is determined primarily by weekly recordings of water flows through Parshall flumes located just downstream from the various headgates or diversion structures in each irrigation ditch system. In the spring of 1997, Water Resource personnel from the RO and State Water Commission checked most of the Refuge flumes and determined that many were not reading accurately. They recommended a 'chip test' be used in order to achieve accurate measurements. The chip test has been used since that time on all flumes documented to be inaccurate. In instances where measuring devices have not been installed, estimates are made relative to the known water use in other irrigation systems in 2001. The Refuge did receive a flow meter last year and there was some use of the meter to determine how accurate flumes were. Efforts will continue this year to use the meter to get more readings on more flumes.

A total of 9,873 acre feet of water was diverted in 2001, approximately 4,770 acre feet less than 2000 and 9,970 acre feet less than 1999. This decrease was mainly weather and river flow dependent. Water flows were all determined by storage and irrigation calls on the Illinois and were administered by the local water commissioner.

Several misconceptions need clarification concerning the Refuge ditches and total acre feet of water used. The total acre feet is determined by adding most ditch flume readings to estimates of acre feet of several spring fed ditches (Table II). It should be noted:

The Hubbard #2 ditch originates off the Illinois River. The Hubbard #3 (Rat Ditch), Hubbard #4 and the Hubbard Caudle Extension all originate off the Hubbard #2, therefore they are not added into the total acre feet diverted.

The Refuge shares water rights on the Midland, Everhard Baldwin and the Howard ditches and total acre feet for each of these ditches is as follows:

Midland Hackley - Acre feet diversion at flume is all Refuge water

Midland Ross - Midland flume reading minus the Hackley flume reading divided in half. The Refuge diverts approximately 50% or 5 cfs of the water, the rest of the water is Anderson's, as Burr's use their 5 cfs before the Midland flume.

Howard - half of the flume acre feet reading, the Refuge has 50% of the water right.

Everhard Baldwin - The Refuge owns 47% of the total acre feet, thus the flume acre feet reading is multiplied by .47.

The Oklahoma #1 flume reading is influenced by large volumes of non-Refuge secondary water during the irrigation season. So in many cases the total acre feet reading for this ditch is much higher than what is actually diverted by the Refuge. If possible, total acre feet should be an estimated amount of the flume reading and/or the headgate should be closed during the irrigation season.

IV. Proposed 2002 Water Use

Water use in 2002 will be influenced by the fact that the majority of Refuge ponds are treated as though they have junior storage rights, which in a dry year means they may not be filled at all. In 2001 a large portion of the Hubbard #2/#4 and most of the Hubbard #3 were cleaned and it is hoped this will improve the efficiency of our water system. Staff also now have a better understanding of the ditch system and have been trying to be more pro-active with irrigation efforts. Optimum water levels will be maintained for as long as possible to encourage waterfowl and other wetland dependent birds breeding, nesting and brood rearing.

One of the following general plans will be implemented dependent upon the availability of water in 2002:

Plan A - Average Water Year

1. Refuge ponds will be filled as early as possible to attract spring migrants to remain and nest. Two to three ponds will be held at 80 percent capacity to provide shoreline habitat for migrating shorebirds during May and early June.

2. Meadow areas will be irrigated by take-outs in the diversion ditches or sub-irrigated by seepage from the ditches.

3. As many ponds as possible will be maintained at optimum levels for as long as possible. If necessary some ponds may be sacrificed for more important brood ponds later in the summer.

4. Following the upstream irrigation season of hay meadows, increased flow in the Illinois River may be used to refill some ponds in order to provide fall migrational habitat and reserve water for the following year.

Plan B - Extremely Wet Water Year

1. Marginal meadow areas not normally irrigated will be irrigated to provide additional wetland habitat for wildlife.

2. Additional water will be circulated through impoundments keeping them fresh, which will aid in the production of emergent and submergent vegetation and encourage invertebrates as sources of food and cover for wildlife.

3. Four to six ponds will be held at 80 percent capacity to provide shoreline habitat for migrating shorebirds during May and early June.

4. Water will run longer in the season keeping ponds relatively full at freeze-up. This will help ensure that at least some water will be available the following spring even in the event of a dry year.

5. By running the water longer, many small wetland depressions in the meadows can be maintained as brood rearing habitat, thus preventing concentrations of broods on a few ponds where they are more susceptible to predation and disease outbreaks.

Plan C - Extremely Dry Water Year

1. Fill as many ponds as possible to capacity and maintain to provide water for breeding and nesting pairs and cover for broods and molters.

2. Irrigate Refuge meadows adjacent to permanent bodies of water.

3. Irrigate Refuge meadows further removed from permanent ponds as available water permits.

4. Review implementation of drawdowns to conserve as much water in the most important ponds for as long as possible.

V. Planned Drawdown

A drawdown plan was established in 1999 and will continue this year. Lack of water can effectively result in an unscheduled drawdown for certain ponds and may be used as such even if it does not coincide with the existing plan (Table III).

Water management is sometimes dictated by priorities set for rehabilitation of dikes and control structures. Rehabilitation will still play a role in selecting which ponds to draw down.

VI. Comments and Problems

The following water management related projects were accomplished in 2001.

1. The water control structure was replaced with a plastic structure in Spring Creek Pond dike.

2. The Hubbard #2/#4 (from where the Hubbard crosses under the fence at Field C1, west across the Highway to where Antelope draw enters the ditch) and Hubbard #3 (from the Highway west to where the ditch meets the Auto Tour Route) were cleaned and structures rehabed.

3. Home #1 was cleaned along its path through Home Pond with take-out and ditch check structures rehabed.

4. Patten, Eagle and Eiseman Ponds water control structures were replaced with plastic structures.

5. Two River gauges were installed in the Illinois River, one on the north end of the Shawver tract and the other on the North end of the Refuge near where Potter Creek enters the Illinois.

6. Nine well points were installed to help determine underground water table levels along the Illinois. The well points were placed in three locations along the River, the first site was in Paddock 26a, the second in Field C23 and the third in Field E1a.

7. The new pond Bilbeisi was constructed along Potter Creek on the Hampton tract.

8. Diversion pond's dike was rehabed, narrow areas were widened and rip-rapped.

9. The water control structure inlet pipe was rehabed on South School Section pond.

10. A new headgate was built and installed in the MacFarlane Extension ditch, a portion of the ditch was rebuilt and the flume was reset.

11. The V-ditcher was put to use this year cleaning the feeder ditch along the Lateral C, along with many small ditches on the Case tract off the Hubbard #4 ditch in fields A6, A9/10 and A11.

The following work, not in priority order, is needed and will be accomplished as manpower and working conditions permit:

1. Determine surface acreage and storage capacity for several existing ponds and all new ponds to verify surface acres and storage capacities.

2. Install and\or rehab Parshall flumes as needed, including Midland Extension, Midland Anderson, Midland Ross, Hubbard #4.

3. Replace deteriorating or missing river headgates on the, Hill & Crouter, Dryer, Ward #2, and Ish Baldwin ditches.

4. Continue ditch cleaning as time and money permit (by contract if possible).

5. Measure capacity of Fish Hatchery spring (Potter Creek) to determine amount of water flowing into Potter #2 ditch.

6. Rehab Reservoir #1 dike and water control structure, work to be done Spring of 2002 (FY2001 MMS Project).

7. Construction of Graf, Schroeder, and Willet ponds on Soap Creek.

Table I - Dry Year Contingency

Headgate Name	Restrictions	Schedule
Boyce Brothers	Refuge has full water right.	Adjust flow rates and timing.
Dryer	Refuge has full water right.	Shorten time frame with lower flow rates or dry up.
Everhard Baldwin	Shared water right.	Refuge does not have control of headgate.
Hill & Crouter	Refuge has full water right	Shorten time frame that ditch runs.
Home #1	Shared water right	Refuge must provide water to private landowner downstream.
Howard	Shared water right	Refuge does not have control of headgate.
Hubbard #1	Refuge has full water right	Adjust flow rates and timing.
Hubbard #2	Refuge has full water right	Adjust flow rates and timing.
Ish Baldwin	Shared water right	Does not have a functioning headgate
Midland	Shared water right	Refuge does not have control of headgate.
North Park #6	Refuge has full water right	Shorten time frame with lower flow rates or dry up.
Oklahoma #1	Refuge has full water right	Open in April, close during irrigation season, re-open after irrigation if needed.
Oklahoma #2	Refuge has full water right	Adjust timing of opening and closing.
Ward #1	Refuge has full water right	Adjust flow rates and timing.
Ward #2	Refuge has full water right	Headgate not operable. Fix or close down?
Ward #3	Refuge has full water right	Shorten time frame with lower flow rates or dry up.

Table II - Total Refuge Diversions

DITCH	REFUGE 2001 ACRE FEET DIVERTED	REFUGE 2000 ACRE FEET DIVERTED	REFUGE 1999 ACRE FEET DIVERTED
Antelope**	150	175	225
Boyce Brothers	306	745	950
Dryer	94	0	203
Everhard Baldwin	1229	1310	1345
Hill & Crouter	0	0	78
Home #1	444	970	912
Howard	1443	1278	1763
Hubbard #1	0	117	287
Hubbard #2	2824	3720	5425
Hubbard #3 (Rat)*	85	339	945
Hubbard #4*	1946	2840	2287
Hubbard Caudle*	793	541	2193
Ish Baldwin**	50	75	100
Midland (Ross)	756	1260	1707
Midland (Hackley)	139	120	241
Midland (Curtis)	460	1026	1235
North Park #6	60	55	519
Oklahoma #1	284	908	596
Oklahoma #2	180	297	820
Potter #2**	100	125	175
Riddle Ditch	31	546	649
State Walden**	500	450	500
State Walden Res.**	35	35	35
Ward #1	688	940	1310
Ward #2**	100	150	210
Ward #3	0	0	214
TOTAL	9873	14302	19499

* Recorded under Hubbard #2.
** These figures are estimates.

Table III - Pond Drawdown Schedule

POND	DATE	PRESCRIPTION	STATUS
Eagle Pond	Late October 1999	Release water into Rat Ditch. Keep pond dry through summer, refill spring of 2001.	Refill of pond delayed due to dry conditions. Will refill in spring of 2002 if water available.
Elk Pond	October 1999	Release water to '76 and Reservoir #2. Keep pond dry through summer, refill spring of 2001.	Completed, but pond was not completely refilled in 2001 due to dry conditions.
Reservoir #1	Tentatively June 2001 or right before construction begins.	Release water to Goose Pond. Keep pond dry through summer and fall, refill spring of 2002.	Water released in fall of 2001, construction scheduled for spring 2002.
S. School Section Pond	May 2001	Release water to N. School Section. Keep pond dry through summer refill spring of 2002.	Delayed due to dry conditions.
Brocker Pond	October 2000	Release water to meadow. Keep pond dry through summer, refill spring of 2002.	On Schedule.
Prairie Dog Pond	Late October 2001	Release water to Antelope Pond. Keep pond dry through summer, refill fall of 2002.	On Schedule.
Rizor Pond	Late October 2001	Release water to Follett Pond. Keep pond dry through summer, refill fall of 2002.	On Schedule.

Schedule is subject to change if dike work is needed on a specific pond.

ANNUAL WATER MANAGEMENT PLAN 2001-2002

Mortenson Lake National Wildlife Refuge
Administered by Arapaho National Wildlife Refuge

I. Water Rights

Priority	Ditch	Date Use	Acre Feet	Acres	Source
Permit #5617	Soda Lake Reservoir	1947 Storage Irrigation	153 AF	--	Pioneer Ditch Natural Springs Runoff
Permit #20459	Soda Ditch	1947 Supplemental	--	188	Pioneer Ditch Natural Springs Runoff
Permit #5631	Harman Reservoir	1947 Storage	87 AF	--	Pioneer Ditch Natural Springs Runoff
Permit #20133 #20132	Harman Ditch	1947 Irrigation 1947 Irrigation	— 1.10cfs	—	Pioneer Ditch Natural Springs Runoff
Permit #4454	Johnson #1 Stock Res.	1962 Storage	1.37 AF	--	Pioneer Ditch Runoff
Permit #4455	Johnson #2 Stock Res.	1962 Storage	1.72 AF	--	Pioneer Ditch Runoff
Permit #7259	Mortenson Lake	1967 Storage	247 AF	--	Pioneer Ditch Natural Springs Runoff

II. 2001 Water Usage

The only water the Refuge received was supplemental runoff water in the South Canal from adjacent landowner Swanson. The South Canal flowed May 14th through June 13th with 62 acre feet of water received. This was 65% less water, running two months shorter than last year. The results of this dry year were apparent especially in Gibbs Lake which had dropped to about 50% capacity by the fall. Water levels and quality of Soda Lake are also decreasing. Snowpacks are poor in Wyoming and the outlook for spring runoff is sparse.

III. Capacity of Refuge Lakes

LAKE	MAXIMUM SURFACE ACRES	MAXIMUM ACRE FEET	ACTUAL SURFACE ACRES (EST.) 4/01	ACTUAL SURFACE ACRES (EST.) 12/01
Mortenson	65	247	63	60
Garber	--	--	--	--
Soda	46	152	46	35
Gibbs	--	--	--	--
Harman	--	--	--	--
TOTAL	111	399	109	111

IV. 2002 Proposed Water Use and Management Needs

Any excess water in the South Canal will be diverted for irrigation purposes as in previous years.

If time and funds permit the following work will be done: replace old nonfunctional water control structure between Meebor and Soda Lakes, rehab the ditch dike along Soda Lake and survey Garber, Gibbs and Harman with GPS units to calculate surface acre capacity.

Continue to investigate conversion of water rights to include 'fish and wildlife' as a purpose in all impoundments.

Continue to investigate the need to file for additional water rights in Soda, Gibbs, Garber and Harmon Lakes.

ANNUAL WATER MANAGEMENT PLAN 2001-2002

Hutton Lake National Wildlife Refuge
Administered by Arapaho National Wildlife Refuge

I. Water Rights

Priority	Ditch	Date Use	CFS	Acres	Source
1	Red	1872 Irrigation	.15	10	Sand Creek
9	Richards	1888 Irrigation	.60	42	Sand Creek
12 ½	Hutton Lake Reservoir	1892 Irrigation	2,500 AF	--	Sand Creek
Permit #5212-E	1st Enlargement Hutton Lake Ditch	1939 Irrigation Bird Refuge	1.6	112	Sand Creek
Permit #2304-E	Enlargement Kings Ditch	1909 Irrigation	Portion of 8.27	Portion of 579	Laramie River

II. 2001 Water Usage

Sand Creek was never opened this year, thus no water was diverted onto the Refuge. Water levels in the lakes declined over the summer with Creighton, North Forty and Rush Lakes completely dry by the end of August. Lake George was approximately 45% full in the fall, but water quality has decreased dramatically making it unusable for a release site for the endangered Wyoming Toad. Hutton and Hoge Lakes were about 40% full by October.

III. Capacity of Refuge Lakes

Lakes	Maximum Surface Acres	Maximum Acre Feet	Actual Surface Acres (Est.) 4/01	Actual Surface Acres (Est.) 12/01
Hutton	221(Variable)	1135	110	88
Hoge	75	200	50	30
Rush	95	250	62	0
George	16	62	12	7
Creighton	210	2525	50	0
Total	617	4172	284	125

IV. 2002 Proposed Water Use and Management Needs

Outlook for any water to divert this year is poor, snowpacks are low and as of March there was a call on the Laramie River. If water does come available it will be used to fill Rush Lake to a capacity that will allow the diversion of water out of Rush Lake to Lake George to re-establish Wyoming Toad habitat and then to the other ponds if water is available.

If time and funds permit the following work will be done: Re-set the Parshall flume and widen the Sand Creek ditch between the headgate and flume.

2002 WATER MANAGEMENT PLAN
2001 USE REPORT
SHORT FORM

Station Name:
Bamforth NWR, WY

Date of Inspection:
June 21, 1989

Water Right No:
1887-Territorial

Source(s):
Little Laramie River

Water Diverted:
Yes

Means of Diversion:
Rate

Impoundments:
Yes

Water Level: 2 AF
(Elev. or Est. Storage)

Wells:
Free Flowing - N/A
Pumped - N/A

Type of Use:
Surface Irrigation Crop
Fish & Wildlife
Stock

Overall Climatic Conditions:

Water conditions were poor in 2001, the Park Ditch was open 7 days with approximately .50 cfs flow. A total of approximately 7 acre feet was diverted.

Conditions of Facilities:

The Park Ditch is in fair to poor condition and in need of some rehabilitation. The cost/benefit ratio of such rehab is questionable due to poor irrigation water rights and availability.

Proposed Water Program:

2002 - Continue to irrigate meadows when adequate water is available in the Park Ditch. Mr. Leonard Johnson, Refuge neighbor and grazing permittee on the refuge, conducts all irrigation activities as a condition of his grazing permit. (Leonard's son Mark Johnson completes most of the field work as Leonard is basically retired)

Comments:
The Park Ditch contains 18.42 cfs of high water right that is not honored except in excellent run-off years because of the large amount of water appropriations senior to its 1887 and 1900 applications. The principal Little Laramie River water user is the Wheatland Irrigation District. The Park ditch receives water only before the District "calls" for its water and only in proper adjudicated order. The Park Ditch headgate is the first one to be closed by the Water Commissioner when the Wheatland Irrigation District calls for water. Our water right for 1.71 cfs in the Park Ditch is therefore a poor water right.